United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued February 26, 2002 Decided May 3, 2002

No. 01-1052

National Petrochemical & Refiners Association,
Petitioner

v.

Environmental Protection Agency,
Respondent

International Truck and Engine Corporation, et al.,
Intervenors

Consolidated with
01-1092, 01-1093, 01-1094, 01-1130, 01-1132,
01-1134, 01-1404, 01-1414

On Petitions for Review of Orders of the
Environmental Protection Agency

Theodore L. Garrett argued the cause for petitioner Cummins Inc. With him on the briefs was Andrew J. Heimert.

Julie R. Domike argued the cause and filed the briefs for petitioner Volvo Truck Corporation.

Michael F. McBride argued the cause for petitioner National Petrochemical & Refiners Association, et al. With him on the brief were Maurice H. McBride, Bruce W. Neely, John W. Lawrence, John S. Hahn, Julie Anna Potts, Janice K. Raburn, David T. Deal, Thomas Sayre Llewellyn and Chet M. Thompson.

William A. Anderson, II, argued the cause for petitioners Alliance of Automobile Manufacturers and Association of International Automobile Manufacturers, Inc. With him on the briefs were Julie C. Becker, Ellen L. Shapiro, Charles H. Lockwood and Susan A. MacIntyre.

Jed R. Mandel and Timothy A. French were on the briefs for Engine Manufacturer petitioners.

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Howard I. Fox and John D. Walke were on the brief for intervenors American Lung Association, et al.

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Hope M. Babcock, Richard Blumenthal, Attorney General, State of Connecticut, Kimberly Massicotte, Assistant Attorney General, M. Jane Brady, Attorney General, State of Delaware, Kevin Maloney, Assistant Attorney General, J. Joseph Curran, Jr., Attorney General, State of Maryland, Kathy M. Kinsey, Assistant Attorney General, Thomas F. Reilly, Attorney General, Commonwealth of Massachusetts,

Kirsten H. Engel, Assistant Attorney General, Philip T. McLaughlin, Attorney General, State of New Hampshire, Maureen D. Smith, Assistant Attorney General, Eliot Spitzer, Attorney General, State of New York, Peter H. Lehner, Assistant Attorney General, Robert A. Reiley, M. Dukes Pepper, Jr., Sheldon Whitehouse, Attorney General, State of Rhode Island, Tricia K. Jedele, Assistant Attorney General, Barbara Beth Baird and Jeri G. Voge were on the brief for intervenors State and Territorial Air Pollution Program Administrators, et al. and amicus curiae South Coast Air Quality Management District. Jennifer L. Wazenski, Assistant Attorney General, State of Maryland, entered an appearance.

Laurence H. Levine, Robert M. Sussman, Julia A. Hatcher, William A. Anderson, II, Susan A. MacIntyre, Julie C. Becker and Ellen L. Shapiro were on the brief for intervenors International Truck and Engine Corporation, et al.

Before: Sentelle and Tatel, Circuit Judges, and Williams, Senior Circuit Judge.

Opinion for the Court filed PER CURIAM.

PER CURIAM:1 We have here a set of challenges to an EPA rule affecting diesel fuel and engines. The rule requires drastic reductions in exhaust emissions starting in 2007 (for some emissions 95% lower than current standards). To aid in the achievement of the new emission standards, the rule also requires a 97% reduction in the sulfur level in diesel fuel. Numerous parties, including engine manufacturers (including Cummins Inc.), automobile makers, and fuel refiners, challenged the rule on various grounds, while others, including environmental groups and states, defended it. We deny the petitions.

## I. The Regulations

Diesel engines emit nitrous oxides ("NOx"), non-methane hydrocarbons, and particulate matter ("PM"), all of which are harmful to the environment and human health (as no party disputes). Fulfilling its duty under the Clean Air Act to set emission standards that "reflect the greatest degree of emission reduction achievable" through cost-effective technology, 42 U.S.C. s 7521(a)(3), the EPA decided on dramatic reductions of diesel engine emission standards, issuing a final rule on January 18, 2001: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, 66 Fed. Reg. 5002 (2001) (hereinafter "2007 Rule").

The 2007 Rule sets the following standards for diesel engines: 0.01 grams per brake-horsepower-hour (g/bhp-hr) for PM, 0.20 g/bhp-hr for NOx, and 0.14 g/bhp-hr for non-methane hydrocarbons. 66 Fed. Reg. at 5005; 40 C.F.R. s 86.007-11(a)(1), (3). For PM and NOx, the new standards

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1 Parts I and II of the opinion are by Senior Judge Williams; part III is by Judge Sentelle; and parts IV and V are by Judge Tatel.

are "90 percent and 95 percent below current standard levels, respectively." 66 Fed. Reg. at 5002. Engine emissions are to be measured by the Federal Test Procedure, see 40 C.F.R. s 86.1301-90 et seq., as well as two other test procedures that are not at issue in this case.

The standard for PM takes full effect in 2007. 66 Fed. Reg. at 5005. The standards for NOx and non-methane hydrocarbons, however, will be phased in as follows: 50% of a manufacturer's sales for 2007, 2008 and 2009 engines and 100% of sales for 2010 and following. Id.; 40 C.F.R. s 86.007-11(g). During the phase-in period, manufacturers will be allowed to participate in an averaging, banking, and trading ("ABT") program. This program allows the generation of credits from engines that beat the standards; the credits can then be applied to engines that may not be able to meet the 2007 standards right away. 66 Fed. Reg. at 5109-11; 40 C.F.R. s 86.007-15. A crucial distinction is made here: Averaging across service classes (e.g., between light heavy-duty engines and heavy heavy-duty engines) is allowed, but not banking or trading. 66 Fed. Reg. at 5110.

The 2007 Rule also eliminates a preexisting exception--available only for turbocharged heavy-duty diesel engines--for emissions from engine crankcases. 66 Fed. Reg. at 5040;

40 C.F.R. s 86.007-11(c). As a result, any crankcase emissions not eliminated count against a vehicle's emission limit.

High pollutant levels in fuel make it impossible or at least far more difficult to achieve low emissions. Thus, under its authority to regulate any fuel components that significantly impair "the performance of any emission control device or system," 42 U.S.C. s 7545(c)(1)(B), the EPA also decided to require "a 97 percent reduction in the sulfur content of diesel fuel." 66 Fed. Reg. at 5002. As of 2006, the maximum sulfur content of diesel fuel will be reduced from 500 ppm to 15 ppm. (Under a 15 ppm cap, the EPA predicts that the average sulfur level in diesel will actually be 7 ppm. Response to Comments at 3-50.) Under its "Temporary Compliance Option," the EPA actually requires that only 80% of fuel from any given refinery meet the 15 ppm cap in years 2006-08. Any overachieving refiner will generate credits, which it can then use to average with another refinery owned by that refiner, bank for future years, or sell to another refiner. 66 Fed. Reg. at 5065.

## II. The Emissions Standards

We review the 2007 Rule under the arbitrary and capricious standard of 42 U.S.C. s 7607(d), which is indistinguishable from the Administrative Procedure Act equivalent. See Ethyl Corp. v. EPA, 51 F.3d 1053, 1064 (D.C. Cir. 1995); Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 519 (D.C. Cir. 1983). Deference is particularly great where EPA's decision is based on complex scientific or technical analysis. Appalachian Power Co. v. EPA, 251 F.3d 1026, 1035 (D.C. Cir. 2001).

### A. Background on Emissions Control Technology

Diesel exhaust emissions can be controlled through the use of catalytic emission control devices in the vehicle's exhaust system. 66 Fed. Reg. at 5007. These resemble the familiar catalytic converters found on ordinary automobiles. Id. Current control devices for diesel engines work less well than they do for gasoline engines, because of diesels' "oxygen-rich and relatively cool ... exhaust environment." Id. at 5009.

PM emissions are also more difficult to control in diesel engines because of the soot formed during diesel combustion. Id. Compounding the difficulties is the fact that "historical diesel NOx control approaches tend to increase PM and vice versa, but both are harmful pollutants that need to be controlled." Id.

Thus, in order to achieve drastic--and simultaneous--reductions in PM, NOx, and non-methane hydrocarbons, engine manufacturers will need technical innovations in emission controls. The EPA predicts that two relatively new technologies will aid in achieving the 2007 reductions: the catalyzed diesel particulate filter ("particulate filter") and the NOx adsorber. 66 Fed. Reg. at 5036. In the following paragraphs, we explain briefly--and to the best of our understanding--how each technology works on the targeted emissions.

Particulate matter is made up of three things: Unburned carbon particles (or soot), unburned hydrocarbons (also called the "soluble organic fraction"), and sulfates (resulting from the oxidation of sulfur in the engine's exhaust). 66 Fed. Reg. at 5047. The majority of diesel PM is soot. Catalyzed particulate filters work by passing the exhaust through a ceramic or metallic filter that captures soot and other PM.

Particulate filters eventually become plugged up with particulate matter, at which point the collected particles (mostly carbon) have to be burned off (or oxidized). Id. The burning-off process is called "regeneration," and the result (from oxidizing carbon) is of course carbon dioxide. Id. The EPA was convinced that precious metal catalysts would make regeneration possible at the low temperatures typical of diesel engines, and that such catalysts could thus be used on a continuous basis throughout the life of the trap. Id.; see also Regulatory Impact Analysis ("RIA") III-6.

NOx adsorbers do their work by storing NOx during the normal oxygen-rich conditions of diesel engine operation. RIA III-18. Over time, the adsorber becomes full of the stored NOx, thus requiring regeneration. During regeneration, the excess NOx is burned off; technically, it is reduced

to N2 by an interaction with carbon monoxide across a catalyst system that typically contains platinum and rhodium; the less-harmful gases that result are N2 and CO2. Id. Like NOx, sulfur from the fuel accumulates over time by bonding to the NOx adsorber's catalysts, and must be burned off during a "desulfation" process (more on that below). The EPA suggests the use of dual-bed NOx adsorbers (for a diagram, see RIA III-23), which involve splitting of the exhaust stream into two pipes, each of which has an adsorber bed. The benefit of such an arrangement is that regeneration and/or desulfation can be conducted in one bed while nearly all the exhaust stream is directed to the bed that is still in adsorbtion mode, thus maintaining a consistent level of performance. RIA III-22 to III-25.

Crankcase emissions are emitted from the vehicle's crankcase, having gotten there by leaking from the combustion chamber through the piston rings. 66 Fed. Reg. at 5040. The EPA's elimination of the previous exception for such emissions is a "performance requirement," leaving the solution entirely up to manufacturers. Id. The EPA predicts that manufacturers will either filter crankcase gases and route them back into the engine intake, or route the gases into the exhaust stream (upstream of any emissions control devices). RIA III-78-79. Another option would be to vent crankcase gases directly to the atmosphere; this is an unlikely choice, because the combined emissions from exhaust and crankcase together would have to fall within the exhaust emissions standards. 66 Fed. Reg. at 5040.

B. Cummins's Challenges

1. Feasibility of NOx and PM Standards

Cummins argues that the EPA acted arbitrarily and capriciously in concluding that engine manufacturers will be able to develop emissions-control systems satisfying the new rule. According to Cummins, the EPA failed to make "reasonable extrapolations," Cummins's Opening Brief at 5 (quoting Natural Resources Defense Council v. Thomas, 805 F.2d 410, 432 (D.C. Cir. 1986)), or to "provide a reasoned explanation for believing that its projection is reliable," id. (quoting National

Resources Defense Council, Inc. v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981)).

In reviewing these issues, we note that EPA was "not obliged to provide detailed solutions to every engineering problem," but had only to "identify the major steps" for improvement and "give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining." Husqvarna AB v. EPA, 254 F.3d 195, 201 (D.C. Cir. 2001) (quoting NRDC, 655 F.2d at 333). Since the EPA is authorized to adopt "technology-forcing" regulations, see NRDC, 655 F.2d at 333; Sierra Club v. Costle, 657 F.2d 298, 364 (D.C. Cir. 1981), a petitioner's evidence that current technology is inadequate is not enough to show that the EPA was arbitrary in predicting future success.

a. Availability of Adequate NOx Adsorbers

In support of its assessment that manufacturers can feasibly meet the 2007 standards using NOx adsorbers, the EPA pointed to the successful results achieved already in various test programs. For example, the National Vehicle and Fuel Emission Laboratory ("NVFEL") program reached the following conclusion: "This test program has shown that NOx adsorbers and [particulate filters] are capable of greater than 90% emission reductions ... after running approximately 200 hours on 5 ppm sulfur equivalent fuel, without a desulfation event. With reasonably expected desulfation, the expected NOx reduction efficiency would be higher." EPA, 2007 Diesel Emission Test Program, Initial Test Report at 31, IV-A-29 (Dec. 11, 2000) (hereinafter "NVFEL Study"); see also RIA III-35 to III-48 (discussing the NVFEL test program). The Department of Energy's Diesel Emission Control Sulfur Effects ("DECSE") program produced several reports finding "NOx conversion efficiencies exceeding 90 percent...." RIA III-35. And ironically, Cummins's own researchers (cited by the EPA's Regulatory Impact Analysis) reported using a NOx adsorber that cut NOx emissions by 98% on the Federal Test Procedure, to a level of 0.055 g/bhp-hr (slightly more than a quarter of the 0.20 g/bhp-hr standard adopted for 2007).

Byron Bunker, Memo to File II-E-25, Handout 6 (Sept. 18, 2000) (Joint Appendix "J.A." III 1947); see also RIA III-34.

Other industry commenters agreed that NOx adsorber technology could be developed and available by 2007. See, e.g., Letter of Manufacturers of Emission Controls Association (April 5, 2000), II-G-60; Testimony of Johnson Matthey (June 22, 2000), IV-F-100; Testimony of the Engelhard Corp. (June 27, 2000), IV-F-188; Letter of Apyron Technologies, Inc. (Aug. 10, 2000), IV-D-227; Letter of the Engelhard Corp. (Oct. 3, 2000), IV-G-38; Letter of Johnson Matthey (Oct. 19, 2000), IV-G-55. Of course it is no surprise that NOx adsorber manufacturers would support a regulation creating a potential for sales of their products. See, e.g., George J. Stigler, The Economic Theory of Regulation, 2 Bell J. Econ. & Management Sci. 3 (1971). But such a manufacturer would risk a considerable loss of reputation if its technology could not fulfill a mandate that it had persuaded EPA to adopt. So the submissions add something to the more direct experimental evidence.

Cummins, however, asserts that no NOx control system will be capable of meeting the EPA's 2007 standards. It presents three reasons to support this conclusion; ultimately, we are convinced by none.

* * *

First, Cummins argues that though the EPA standards in effect require NOx adsorbers to operate at 90% efficiency, rapid degeneration will prevent them from lasting for anywhere near the useful life of a heavy heavy-duty diesel engine. According to Cummins, the EPA's tests showing the requisite 90% efficiency were short-term rather than for extended periods.

Cummins fails, however, to give a full picture of the EPA's research. Whereas Cummins claims that a certain EPA test was only short-term, it actually involved a NOx adsorber system that had already accumulated "190 hours of operation," the equivalent of "more than 13,000 miles of driving." RIA III-48. Moreover, the test did not include any desulfa-

tion events (see below), which likely reduced performance; even so, the NOx adsorber was almost able to meet the 2007 standard. Id. (Table III.A-4). Cummins also cites a test mentioned at 66 Fed. Reg. 5049 as showing that degradation happens after 600 miles. But that test used 150 ppm diesel fuel--10 times the maximum level allowed by the 2007 Rule (and 20 times what EPA believes the 15 ppm cap will yield in practice). Cummins also complains that the DECSE study cited by the EPA showed that 90% efficiency declined to 75% after only 40 hours--and that was using 3 ppm sulfur fuel to boot. Cummins's Opening Brief at 8 (citing RIA III-66 & Fig. III.A-15). Overall, NOx adsorber performance degraded by 2% per hour of operation, with higher degradation when higher sulfur fuel was used. Id. (citing RIA III-67). But the EPA never denied that degradation is currently something of a challenge; what matters is whether (as discussed below in regard to desulfation) the EPA was arbitrary or capricious in predicting that degradation could eventually be controlled.

* * *

In a closely-related argument, Cummins urges that the desulfation process is an intractable obstacle to long-lasting NOx adsorbers. As we've said, the NOx adsorber works primarily by adsorbing NOx on catalysts. 66 Fed. Reg. at 5059. Sulfur, however, bonds to the catalysts as well, clogging up the catalyst sites and degrading performance. Id. To prevent degradation, NOx adsorbers must periodically be subject to "desulfation," a process that removes sulfur. Desulfation, however, requires that exhaust temperatures be increased--and this in turn poses a risk of so-called "sintering," in which the catalysts are melted. Id. at 5060. Sintering, unsurprisingly, degrades the device's future NOx adsorbance. Id.

The result, according to Cummins, is a technical "catch-22" that pulls manufacturers in "conflicting directions." On one hand, desulfation should happen often and at high temperatures to prevent clogging by sulfur; on the other hand, frequent, high-temperature desulfation itself degrades NOx

adsorbance. As Cummins sees it, the EPA presents no reason to think that this technical obstacle will be overcome, other than "unsupported predictions of government and private-sector observers, who assert in conclusory fashion that technology that overcomes these inherent problems will develop in due time." Cummins's argument turns on its heavy discounting of the studies relied on by EPA.

Cummins says that the Ford Study (Mark A. Dearth et al., Sulfur Interaction with Lean NOx Traps (Oct. 1998) J.A. III 2187)) is not strictly relevant because it was performed using a "pulsator," a device that burns synthetic gases and injects pollutants to test catalyst performance. Cummins seems to regard it as self-evident that the use of a pulsator leads to inaccurate or inapplicable results. In making this assumption it overestimates our technical sophistication. The EPA argues in response that the pulsator experiment does shed light on the ability of NOx adsorbers to withstand desulfation. As Cummins gives no articulable reason to doubt this conclusion, we cannot fault the EPA for having relied on the study.

As for Cummins's objection that further Ford experiments found significant degradation, the EPA observes that these further experiments were conducted at temperatures of 900 to 1000 degrees Celsius (see Ford Study, J.A. III 2192-93), whereas a "heavy-duty diesel engine in contrast rarely has exhaust gas temperatures in excess of 500ø C." RIA III-68. Given the adverse effect of excessive heat, this seems a pertinent response.

Cummins complains that the DECSE study showed that while desulfation did improve adsorber performance (compared to a sulfur-clogged state), it did not return the adsorber's performance to prior levels. Cummins's Opening Brief at 10 (citing RIA III-66 & fig. III.A-15, J.A. IV 2480). Moreover, the DECSE study showed that even without the presence of sulfur, the desulfation-phase temperatures caused a "continued decline in the catalyst's desulfated performance." Id. (citing RIA III-67 & fig. III.A-16).

The EPA, for its part, admits that the equipment used for the DECSE test was not optimized for durability, but notes that the EPA already pointed out several engineering steps that would help adsorbers "to better withstand potential thermal sintering from desulfation." For example, the EPA cited technical solutions used in light-duty vehicles, such as "modifications to the catalyst supports and surface structures that stabilize the precious metals at high temperatures," and "strengthening of crystalline lattice structures." RIA III-68; see also Respondent's Brief at 23; 66 Fed. Reg. at 5060. Other steps identified by EPA include careful control of maximum temperatures during desulfation, and lowering the air-to-fuel ratios. RIA III-69.

* * *

Finally Cummins argues that compliance with the Federal Test Procedure will be impossible because of reduced performance during the so-called "cold start" section of that test. The Federal Test Procedure has two main sections--a "cold start" period of 20 minutes, and then a "hot start" period of another 20 minutes. 40 C.F.R. s 86.1330-84(a); RIA III-49. Separate tests are needed because the catalysts in NOx adsorbers are ineffective at lower temperatures; according to EPA data, NOx adsorber efficiency does not reach 90% until the temperature is above 275 degrees Celsius. RIA III-32.

The NVFEL tests did not include the cold-start portion of the Federal Test Procedure. See RIA III-49. This was because the "adsorber system was not optimized for cold start performance," see NVFEL at 24 (J.A. III 2114)--though why such optimization was left undone, we do not know.

Nevertheless, the EPA relied on averaging, pointing out that a "manufacturer could achieve the composite FTP standard with considerably less than 90 percent reduction over the cold-start test, provided the hot-start test achieves greater than 90 percent reduction." RIA III-51, J.A. IV 2465. The weighting system of the Federal Test Procedure helps the EPA's arithmetic on this--the hot-start cycle counts as

6/7 of the final result, leaving a mere 1/7 to the cold cycle. See 40 C.F.R. s 86.1342-90(a); RIA III-49. Thus modest overachievement in the hot cycle can offset considerable underachievement in the cold. Cummins notes, however, that if the cold-start cycle on a particular engine were only 50% efficient, then the hot-start cycle would have to achieve 96.7% efficiency. And if performance during the cold-start period dropped below 30%, then it would be mathematically impossible to meet the standard (because the hot-start period would have to be more than 100% efficient).

EPA responds that this argument was never raised before now, and is thus barred. See 42 U.S.C. s 7607(d)(7)(B); Respondent's Brief 25-26 (citing Appalachian Power Co. v. EPA, 249 F.3d 1032, 1055 (D.C. Cir. 2001)). But Cummins answers that it raised the issue with "reasonable specificity," as required by the statute. Its comments argued that NOx adsorbers did not work "over the entire range of engine operating conditions," and that adsorbers work "at only isolated steady-state condition [sic] within a narrow temperature range." While neither of these comments specifically mentions the cold-start portion of the Federal Test Procedure, they do raise the underlying issue of poor performance at certain temperatures. Since the word "reasonable" should not be "read out of the statute in favor of a hair-splitting approach," Appalachian Power Co. v. EPA, 135 F.3d 791, 817 (D.C. Cir. 1998), Cummins's objections seem close enough to have put the EPA on notice that it had to defend the performance of NOx adsorbers at all relevant temperatures and conditions.

On to the merits: EPA says that Cummins wrongly depicts the "cold start" test period as if the engine and exhaust system were cold throughout the period. But in fact the emission control system warms up throughout the "cold start" period. EPA cites--by way of analogy--tests done on gasoline engines that found that catalyst temperatures of 450 degrees could be reached in a mere 30 seconds after a cold start. Joseph McDonald & Lee Jones, Demonstration of Tier 2 Emission Levels for Heavy Light-Duty Trucks, at 25, IV-G-131 (J.A. III 2176). If similar steps were taken for

diesel engines, then the portion of the Federal Test Procedure that would be conducted in a genuinely "cold state" would make up a trivial percentage of the weighted score for the test.

Moreover, the RIA discussed a number of ways by which cold start performance could be improved. RIA III-49-51. Cummins has not shown that EPA was arbitrary in believing that, collectively, they would provide an adequate solution.

In sum we find no basis for reversing EPA's prediction of the future development of adequate NOx adsorbers.

b. Availability of NOx Sensors

Cummins asserts that the new standards for 2007 will require NOx sensors that are not and will not be available. Cummins points out that regeneration (essential for burning off the accumulated NOx from the NOx adsorber) has to be triggered by a NOx sensor that measures the rising levels of NOx in exhaust gas (as rising levels indicate degenerating performance of the adsorber). But, says Cummins, such sensors "do not exist." Cummins believes the studies relied on by EPA fail to support its belief in the future availability of such sensors.

EPA relied in part on the "Kato" study (Nobuhide Kato et al., Long Term Stable NOx Sensor with Integrated In-Connector Control Electronics, SAE 1999-01-0202, J.A. VI 3913) as demonstrating that current NOx sensors are "capable of detecting NOx emissions in the 100 ppm range." Response to Comments 7-22. Cummins notes that the paper shows data only from the 70 ppm to 400 ppm range (Cummins's Reply Brief at 6, citing J.A. VI 3916), and argues that it is impermissible to extrapolate the results to the 15 ppm range (as does EPA, see Respondent's Brief at 29) because errors that are relatively minor at a high level would be fatal at a low one. If this were EPA's sole basis, and if EPA were required to show present availability of proper sensors, this might be a winning argument. Neither is true.

EPA also relies on the NVFEL test program, which successfully used NOx sensors. Response to Comments 7-22.

Cummins argues that during this test program regeneration was controlled manually, see NVFEL Study at 15 (J.A. III 2105), so that the test failed to prove that sensors could control regeneration in real-life situations. The EPA, by contrast, seems to imply that NOx sensors were used to trigger every regeneration event. In fact, neither side is precisely correct. For the NVFEL tests, the engineers first performed a process they called "steady state optimization," the function of which is to figure out the conditions for regeneration that will minimize emissions and fuel economy impact. NVFEL Study at 14, 16. (J.A. III 2104, 2106.) The optimization methods used, including the ones in which manual operation played a role (described at NVFEL Study 15), involved the use of a NOx sensor to determine the best time for regeneration. But for the actual tests of emissions, the engineers used a "time-based regeneration schedule," NVFEL Study at 24, so that "regenerations occurred at predetermined engine conditions during the transient cycle." Id. So, while it may be literally true (as Cummins says) that the ultimate test results do not directly prove that a NOx sensor could independently trigger regeneration as needed, the test offers indirect proof, as NOx sensors were essential in optimizing the system so that the NOx adsorber could reduce emissions by greater than 90 percent. NVFEL Study at 21, Figure 5.3. Cummins thus fails to show arbitrariness in the EPA's prediction that adequate NOx sensors will be available.

More generally, the EPA claims that adequate NOx sensors have already been developed. Respondent's Brief 28 (citing RIA III-56; Sherwood Memo to Docket, IV-B-10 (J.A. II 1097-98)). Contrary to Cummins's implication, the latter document concludes that a NOx sensor can successfully "be used to control both NOx regeneration of a NOx adsorber system, and diagnosis of the NOx adsorber system."

Again, Cummins has not shown that the EPA acted arbitrarily or capriciously.

c. Feasibility of the Crankcase Standard

Here Cummins argues that it is not feasible to eliminate the prior exception that allowed crankcase emissions from

heavy-duty engines. As discussed above, the EPA envisions that eliminating crankcase emissions will require manufacturers either to (1) use a crankcase filtration system, with "blow-by" gas routed to the engine's air-intake system, or (2) route the emissions into the exhaust system upstream of the emissions control equipment. RIA III-78-79.

According to Cummins, however, the filtration systems are only 80% effective, id., leaving 20% of crankcase emissions to go back and foul the intake system. See 66 Fed. Reg. at 5040/3 (attributing prior exception for crankcase emissions from turbocharged heavy-duty diesels to concern over such fouling). The EPA notes, however, that such filtration systems are already required in Europe (see 66 Fed. Reg. 5040), and have been used on a Mercedes heavy-duty diesel engine in the United States since 1999 (see Response to Comments 3-88). (Cummins's Reply Brief's citation of DaimlerChrysler's discussion of "filter plugging" is not inconsistent with Mercedes's practice, as the DaimlerChrysler remark was directed to particulate filters, not crankcase systems. See J.A. III 1717-18.) Cummins presents no evidence that these systems have caused material fouling of turbochargers.

Cummins also complains that the EPA made no findings whatever about the durability of crankcase filtration systems; this is of concern because the systems would be required to last 50,000 miles or 1,500 hours, see 40 C.F.R. s 86.007-25. But the issue was not raised until now and is therefore waived. See 42 U.S.C. s 7607(d)(7)(B); cf. 40 C.F.R. s 86.094-25(b)(7) (allowing manufacturers to seek approval to replace emissions systems at intervals shorter than 50,000 miles).

Because the rule can stand so long as there was one solution as to which EPA's prediction was not arbitrary, we shall not proceed to evaluate the second option--venting crankcase emissions into the exhaust system.

d. The Effects of Sulfur

One last bit on feasibility: Cummins argues (in one paragraph) that even with fuel sulfur reduced as low as 15 ppm,

sulfur can still cause PM emissions that are up to 60% of the 2007 limit. Standing alone, the point seems meaningless (as 60% is less than 100%). Cummins seeks to render it meaningful by also arguing that EPA failed to consider potential increases in PM resulting from crankcase emissions and cold-start problems. But as EPA points out, Cummins failed to raise these in the rulemaking, so they are waived pursuant to 42 U.S.C. s 7607(d)(7)(B).

2. Accuracy of Measuring Equipment

Cummins's second main argument is that there will be no testing equipment accurate enough to measure the extremely low emissions required by the new regulation. Cummins claims that the equipment currently available is plagued by too much variability and inaccuracy. Assuming this to be true (and some such errors are inevitable), it would not provide a basis to upset the rule. As we said in Amoco Oil Co. v. EPA, 501 F.2d 722 (D.C. Cir. 1974):

> The possibility of statistical measurement error ... merely deprives the agency of the power to find a violation of the standards, in enforcement proceedings, where the measured departure from them is within the boundaries of probable measurement error. Furthermore, if the test methods eventually adopted raise a greater potential for error than is practical or necessary, a reviewing court may order revisions.

Id. at 743. Accordingly, issues about the reliability of testing methods can be addressed at a later stage.

3. Possible Misfueling in Canada and Mexico

Cummins's last main argument is that the rule unlawfully exposes manufacturers to the risk of recalls resulting from the "poisoning of catalysts from fueling of vehicles in Mexico and Canada." But the risk, if not simply nil, is so remote as to render the claim unripe. If the alleged poisoning occurs (because many trucks operate in both the U.S. and Canada and Mexico, and on the assumption that one or both neighboring countries will fail to mandate 15 ppm diesel fuel),

Cummins would apparently have a good defense to a recall action. The recall-authorizing statute provides that a recall can be ordered only if "a substantial number of any class or category of vehicles or engines, although properly maintained and used, do not conform to [the emission standards]." (42 U.S.C. s 7541(c)(1)) (emphasis added). On Cummins's scenario, the border-crossing trucks would not have fulfilled the proper maintenance condition. Indeed, EPA explicitly abjured any right to demand recalls for exceedences caused by "the use of high-sulfur (>500 ppm) fuel in Alaska during the period of the temporary sulfur exemption" that it had granted in reference to Alaska. 66 Fed. Reg. 5086/2.

III. Diesel Fuel Sulfur Standard

Under 42 U.S.C. s 7545(c)(1), EPA is empowered to regulate fuel content if the Administrator either determines that (A) "any emission product of such fuel ... causes, or contributes, to air pollution which may reasonably be anticipated to endanger the public health or welfare," or (B) "emission products of such fuel ... will impair to a significant degree the performance of any emission control device or system which is in general use, or which ... would be in general use were such regulation to be promulgated." 42 U.S.C. s 7545(c)(1)(A) & (B). We first consider whether EPA's 15 ppm sulfur rule is justified as protecting public health or welfare under s 7545(c)(1)(A). Determining it is not, we consider whether EPA's decision to regulate diesel fuel in order to prevent impairment of sulfur-sensitive emission control devices was arbitrary, capricious, or otherwise contrary to law. We conclude it was not. Finally, we consider and reject the remaining challenges to the 15 ppm sulfur rule brought by petitioners National Petrochemical & Refiners Association, et al. ("NPRA"), and deny their petition for review.

A. Basis for the Diesel Fuel Standard

At the outset, EPA argues that the ultra-low diesel fuel standard of 15 ppm sulfur is justified as a regulation to protect public health or welfare under 42 U.S.C. s 7545(c)(1)(A), as well as to prevent impairment of sulfur-

sensitive control technology under s 7545(c)(1)(B). Because NPRA only challenges EPA's determination under s 7545(c)(1)(B) (specifically, the availability of sulfur-sensitive control technology), EPA contends that we must dismiss the petition for review. However, we agree with NPRA that EPA has not justified the 15 ppm sulfur requirement under the "public health or welfare" rubric of s 7545(c)(1)(A). Although it is possible EPA could have justified the 15 ppm sulfur limit based on effects on public health and welfare, here it has not done so. EPA makes no findings that justify a choice of a 15 ppm limitation (rather than some other concentration) on the bases of health and welfare.

EPA's justifications for a 15 ppm sulfur rule in this proceeding belie its post-hoc assertion that it was regulating pursuant to its authority under s 7545(c)(1)(A). Although the Agency cited general health and environmental effects of diesel exhaust, as well as sulfur dioxide formation, e.g. 66 Fed. Reg. 5002, 5021-23 (2001), it explicitly declared that "[w]e are requiring significant reductions in diesel fuel sulfur to enable certain emission control devices to function properly." Id. at 5034 (emphasis added). Indeed, EPA justified the 15 ppm standard (as opposed to some other concentration) as necessary for effective operation of the NOx adsorber and PM trap. See id. at 5053; id. at 5047. In the section of the final rule entitled "Need for Low Sulfur Diesel Fuel," 66 Fed. Reg. at 5056, EPA did not mention health or environmental concerns. Rather, relying on the three factors of "efficiency, reliability, and fuel economy," EPA concluded that "diesel fuel sulfur levels of 15 ppm will be required in order to make feasible the heavy-duty vehicle emission standards." Id. EPA referred to control technologies being "directly affected by sulfur in diesel fuel," and concluded that "[b]ased on the strong negative impact of sulfur on emission control efficiencies for all of the technologies evaluated, we believe that 15 ppm represents an upper threshold of acceptable diesel fuel sulfur levels." Id. Further, according to EPA, its analysis "makes clear that diesel fuel sulfur levels will need to be under 15 ppm in order to ensure robust operation of the technologies under the variety of operating conditions antici-

pated to be experienced in the field." Id. EPA made no commensurate findings that the 15 ppm sulfur concentration is needed to protect public health or welfare.

Similarly in the section entitled "Our Program for Controlling Highway Diesel Sulfur," EPA stated: "With today's action, we are requiring substantial reductions in highway diesel fuel sulfur levels nationwide, because sulfur significantly inhibits the ability of the diesel emission control devices to function which are necessary to meet the emission standards finalized today." Id. at 5063 (emphasis added). It could hardly be clearer--EPA is regulating sulfur because of its effects on emission-control devices, and not for health and welfare reasons. Therefore, the 15 ppm sulfur rule either rises or falls with EPA's justification under 42 U.S.C. s 7545(c)(1)(B).

B. Sulfur-Sensitive Control Technology

NPRA argues that EPA's 15 ppm sulfur requirement is arbitrary, capricious, and contrary to law because EPA has failed to show that the emission-control technology requiring ultra-low sulfur fuel is in or near general use. Specifically NPRA contends that NOx adsorption technology requiring 15 ppm sulfur diesel fuel will not be "in general use" even if this fuel standard is adopted. Further, NPRA argues that the PM control technology does not require ultra-low sulfur fuel. As discussed in Part II.B, supra, EPA has reasonably determined that NOx adsorption technology will be available. The record contains ample support for EPA's conclusion that NOx adsorbers will be available by 2007 if fuel sulfur is regulated. Although some research remains to be done to solve the problem of catalyst sintering (deterioration caused by desulfation--high temperature operation to remove sulfur building up on the catalyst), petitioners have identified no theoretical barriers to the development of NOx adsorbers. "In the absence of theoretical objections to the technology, the agency need only identify the major steps necessary for development of the device, and give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining." NRDC, 655 F.2d at 333. Here EPA notes

that NOx adsorbers are used in gas turbine systems and natural gas fired powerplants. EPA claims that the "differences between these current applications of the NOx adsorber technology and the future use of NOx adsorbers to control NOx emission from diesel engines lies only in the need to adapt the diesel engine operation to the NOx adsorber performance." It is only necessary that a desulfation cycle be developed--and EPA cites evidence that such research is under way. EPA has evidence that application of this technology is feasible, appears to have set forth an engineering path rather than mere optimism, and has given a reasoned explanation why it believes this path can be followed. See 66 Fed. Reg. at 5052. That is sufficient: "EPA is not obliged to provide detailed solutions to every engineering problem posed in the perfection of the [technology]." NRDC v. Thomas, 805 F.2d 410, 434 (D.C. Cir. 1986) (quoting NRDC, 655 F.2d at 333).

Petitioners' claim that our decision in Amoco Oil Co. v. EPA, 501 F.2d 722 (D.C. Cir. 1974), prohibits EPA from relying on technology that is still in the testing stage as the basis of fuel regulation under 42 U.S.C. s 7545(c)(1)(B) is without merit. In Amoco, it was the petitioner who sought to upset EPA's judgment of non-feasibility and require the Administrator to consider technology alternatives to the catalytic converter that were in the testing stage. This Court merely found that EPA was not required to evaluate such technologies, when in EPA's reasoned judgment such technologies would not be "in general use" but the catalytic converter would be in such use. See Amoco, 501 F.2d at 738-39. In the present context, however, it is EPA that believes NOx adsorption technology will be available. Where, as here, EPA's decision is based on complex scientific or technical analysis, it is entitled to "great deference." Appalachian Power Co. v. EPA, 251 F.3d 1026, 1035 (D.C. Cir. 2001) (citation omitted). If anything, Amoco supports EPA's position. In Amoco, EPA had required emissions reductions that necessitated the use of catalytic converters. 501 F.2d at 726. Similarly, EPA is now requiring reductions that necessitate the use of NOx adsorbers. 66 Fed. Reg. at 5005-06. In

Amoco, EPA had found that no other emission reduction system would be in general use by the effective date of the rule. 501 F.2d at 738. In the present case, EPA found that NOx adsorbers (and only NOx adsorbers) will be "in general use." 66 Fed. Reg. at 5049-53. In sum, because EPA's determination that NOx adsorption technology will be available is reasonable, EPA has met the statutory prerequisite to regulating the sulfur content of diesel fuel under 42 U.S.C. s 7545(c)(1)(B).

NPRA also contends that the decision to regulate under s 7545(c)(1)(B) was arbitrary and capricious because EPA overlooked sulfur-resistant technology, namely Selective Catalytic Reduction ("SCR"). Petitioners argue that EPA treated NOx adsorption technology and SCR technology inconsistently--having optimism for the former and disfavoring the latter. That may be. Nonetheless as noted above, EPA is entitled to deference in its evaluation of technologies, and in any event EPA identified several practical obstacles to the widespread implementation of SCR technology. In particular, SCR systems require refilling with urea on a regular basis (3-6 gallons for every 100 gallons of fuel) in order to operate and are subject to abuse. See 66 Fed. Reg. at 5053. Failure to replenish the urea does not cause a loss in driving performance (so truckers may have little incentive to spend resources on urea) but does reduce emissions reductions. See id. Furthermore, there is currently no system in place to distribute urea to truck stops or other retail outlets for dispensing into vehicles, and the evidence before EPA would support a determination that these problems would not be solved by model year 2007. See 66 Fed. Reg. at 5053. Given these concerns, EPA reasonably determined that SCR was not a viable means of achieving NOx emissions reductions, and that sulfur-sensitive technology, and thus ultra-low sulfur diesel, would be required.

EPA's determination that NOx adsorption technology is viable and necessary justifies the 15 ppm sulfur diesel fuel standard; therefore, we need not consider whether the diesel fuel standard is necessary for the operation of PM control technology.

C. Other Challenges to the Diesel Fuel Standard

NPRA raises several other objections to the diesel fuel standard, most of which may be dismissed summarily. First, petitioners contend that the phase-in (or temporary compliance option, as EPA prefers) renders the 15 ppm standard arbitrary and capricious. Although we find that petitioners have standing (because of the alleged harm to distributors in carrying the extra grade of fuel), we find no merit to the claim that the phase-in undermines the fuel standard and reject the claim that the decision to phase-in ultra-low sulfur diesel is arbitrary and capricious. Similarly, although we find petitioners to have standing to challenge the selection of ASTM Method 6438 as the primary test method, we find nothing arbitrary or capricious in EPA's selection of this test method. Third, petitioners' argument that EPA failed to comply with the Regulatory Flexibility Act is devoid of merit. Finally, that brings us to NPRA's allegation that the decision to require 15 ppm sulfur content will result in a shortfall in diesel fuel. Although we ultimately reject this claim, it requires more elaborate consideration.

42 U.S.C. s 7521(a)(3)(A)(i) mandates that EPA "giv[e] appropriate consideration to cost, energy, and safety factors" associated with technology needed for the emissions standards it sets--which also includes the cost of fuel compatible with that technology. Similarly, 42 U.S.C. s 7545(c)(2)(B) requires that EPA consider "available scientific and economic data." If EPA promulgated a regulation that would in fact result in a diesel fuel shortage or energy crisis, it would be acting arbitrarily and capriciously--failing to give "appropriate consideration to cost [and] energy" in setting emissions standards under s 7521(a)(1), and failing to consider the "economic data" in regulating diesel itself under s 7545(c)(1). 42 U.S.C. ss 7521(a)(3)(A)(i), 7545(c)(2)(B). Therefore, if EPA's assessment of diesel fuel availability under its regulation of diesel fuel is unreasonable, then it has not properly considered all of the relevant factors and its fuel regulation should be vacated and remanded as arbitrary and capricious.

Petitioners argue that EPA's estimating technique for assessing highway fuel loss due to cross-contamination in the pipeline system is inadequate. They contend that when ultra-low sulfur diesel fuel and non-highway diesel fuel are transported in tandem, the former will be contaminated by the sulfur in the latter at the interface volume. This contaminated fuel cannot be used as highway fuel, as it would damage the emission control devices. EPA assumed that this loss would be only twice the current loss from transport of 500 ppm sulfur diesel fuel and non-highway diesel fuel. EPA's fundamental assumption was that the interface volume would not change. However, as petitioners argue, this fundamental assumption may be incorrect.

Petitioners point out that "EPA considered only pipeline diameter and length in calculating today's losses, but not the different sulfur concentrations in the various products in pipelines or the relative margin for error given the very low allowed sulfur level." For example, "[i]t would take less than 0.5 percent of 3000-ppm sulfur containing product to contaminate [ultra low sulfur diesel] ... to a level above EPA's maximum of 15 ppm." Petitioners note that "the size of the interface volume pipeline operators will presume is affected by adjoining products is likely to grow dramatically with [ultra low sulfur diesel]," but that EPA has assumed the interface volume will remain constant. Additionally, EPA may further have underestimated the contamination loss by failing to consider diffusion from residue on the walls of the lines carrying the fuel. EPA, Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements IV-90 (Dec. 2000).

Even assuming EPA made missteps in calculating cross-contamination, the burden is on petitioners to demonstrate that EPA's ultimate conclusions are unreasonable. Cross-contamination is only a sub-issue of the critical question of adequacy of projected supply. Petitioners have failed to show that EPA's overall determination that there will not be a diesel shortfall is unreasonable. EPA contends that there are adequate economic incentives to ensure that refiners will not abandon the highway diesel market, and that several

refineries would have incentive to enter the diesel market. Although EPA's effort at estimating losses due to cross-contamination may be flawed, petitioner fails to show that cross-contamination will result in a shortfall. Therefore, while perhaps EPA could have been more thorough, we deny the petitioners' challenge.

In sum, we deny all of the challenges brought by NPRA to the 15 ppm sulfur diesel fuel standard.

IV. Mack Truck Petition

Petitioner Mack Truck challenges EPA's changes to its Averaging, Banking and Trading ("ABT") program. This program allows engine manufacturers who produce engines cleaner than those required by the regulations to generate "credits" that they may then use to offset higher emitting engines ("averaging"), save for future use ("banking"), or sell to other manufacturers ("trading"). See 40 C.F.R. s 86.004-15. Traditionally, EPA has prohibited engine manufacturers from applying credits generated by light heavy-duty or medium heavy-duty engines to heavy heavy-duty engines. See 40 C.F.R. s 86.004-15(d), (e), (f)(3). The new rule allows such cross-subclass averaging, but only during the 2007-09 phase-in period. See 2007 Rule, 66 Fed. Reg. at 5164 (to be codified at 40 C.F.R. s 86.007-15(m)(10)). Furthermore, when manufacturers use credits from one diesel engine class in calculating the emissions of another diesel engine class, credits are discounted by 20%. Id. at 5163 (to be codified at 40 C.F.R. s 86.007-15(m)(3), (4)). Cross-subclass banking and trading remain prohibited. Id. at 5164 (to be codified at 40 C.F.R. s 86.007-15(m)(10)).

Mack's complaint about these new provisions stems from the fact that it makes only heavy heavy-duty engines. According to Mack, because manufacturers cannot make a compliant heavy heavy-duty engine without sacrificing some fuel efficiency and because Mack's customers are extremely sensitive to cost increases generated by decreased fuel economy, the new rule will likely force Mack to purchase emissions credits from manufacturers of the same engine class. Anticipating these harmful consequences, Mack urges us to find the

revised ABT program's allowance of cross-subclass averaging unlawful because EPA failed: (1) to give interested parties notice and opportunity to comment in violation of 42 U.S.C. s 7607(d)(6)(C); (2) to summarize in the record conversations had with Mack's competitors in violation of 42 U.S.C. s 7607(d)(6)(C); and (3) to give a reasoned explanation of its new program, cf. Motor Vehicles Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 52 (1983) (requiring agency to give reasoned explanation for decision). EPA contests these claims, but also argues that, in any case, Mack lacks prudential standing to challenge the allowance for cross-subclass averaging. We begin with this threshold issue.

To demonstrate prudential standing, Mack must show that "the interest it seeks to protect 'is arguably within the zone of interests to be protected or regulated by the statute ... in question.' " Cement Kiln Recycling Coalition v. EPA, 255 F.3d 855, 870 (D.C. Cir. 2001) (quoting Ass'n of Data Processing Serv. Orgs. v. Camp, 397 U.S. 150, 153 (1970)) (alteration in original). This "test is not meant to be especially demanding." Clarke v. Secs. Indus. Ass'n, 479 U.S. 388, 399 (1987). Indeed, a petitioner "is outside the statute's 'zone of interests' only 'if [petitioner's] interests are so marginally related to or inconsistent with the purposes implicit in the statute that it cannot reasonably be assumed that Congress intended to permit the suit.' " Motor & Equip. Mfrs. Ass'n v. Nichols, 142 F.3d 449, 458 (D.C. Cir. 1998) (quoting Clarke, 479 U.S. at 399). In determining whether a petitioner falls within the "zone of interests" to be protected by a statute, "we do not look at the specific provision said to have been violated in complete isolation[,]" but rather in combination with other provisions to which it bears an " 'integral relationship.' " Fed'n for Am. Immigration Reform, Inc. v. Reno, 93 F.3d 897, 903 (D.C. Cir. 1996) (quoting Air Courier Conference v. Am. Postal Workers Union, 498 U.S. 517, 530 (1991)).

With these principles in mind, we turn to the facts of this case. According to Mack, "the structure of the CAA engine certification program" demonstrates that Congress intended EPA to consider anticompetitive injury. Mack Truck's Reply Br. at 2. Mack points to the provisions of the statute that

require manufacturers to pay nonconformance penalties ("NCPs") if they produce noncompliant engines. See 42 U.S.C. s 7525(g)(3)(E). These NCP provisions mandate that "penalties ... remove any competitive disadvantage to manufacturers whose engines or vehicles achieve the required degree of emission reduction." Id. Thus, Mack reasons, its interest in avoiding anticompetitive injury plainly falls within the zone of interests Congress sought to protect.

Although EPA established the current ABT program pursuant to CAA section 202(a), id. s 7521(a), the general grant of authority to regulate pollutants that "cause[ ] or contribute[ ] to air pollution which may reasonably be anticipated to endanger public health or welfare," id. s 7521(a)(1), not pursuant to the NCP provisions, we agree with the general thrust of Mack's argument, as it appears to us that the two provisions enjoy an "integral relationship." EPA itself has observed the obvious, namely, that "averaging, banking and trading ... provide another way besides payment of NCPs for engines to meet emission standards." Certification Programs for Banking and Trading of Oxides of Nitrogen and Particulate Emission Credits for Heavy-Duty Engines, 54 Fed. Reg. 22,652, 22,666 (May 25, 1989). Thus, EPA developed the ABT program to be compatible with the NCP provisions. See id. at 22,658 (noting EPA's concern that a manufacturer might " 'game' the programs by requesting [cheaper] NCPs for engine families that could be meeting the emission standard by averaging"); id. at 22,680 (suggesting "credits for banking and trading should not be generated by either single engine families or any engine families within an averaging set where NCPs are used"). Moreover, the allowance for trading "accomplish[es] one of the express goals of the NCP provision--[the] remov[al of] any competitive disadvantage from complying manufacturers--since the price of credits ... reflect[s] the economic cost of obtaining the standard technologically." Id. at 22,666. In light of the "integral relationship" between section 202(a) and the NCP provisions, which explicitly refer to anticompetitive effects, we think it at least "arguable" that Congress intended EPA to

take into account anticompetitive impacts should it establish an ABT program.

Having found that Mack has prudential standing, we can easily dispose of its procedural challenges to the ABT program. Setting a high bar for such challenges, the Clean Air Act requires the challenger to demonstrate a "substantial likelihood" that the rule would have been "significantly changed" absent the alleged error. 42 U.S.C. s 7607(d)(8). EPA argues that because Mack not only had actual notice of the proposal to allow cross-subclass averaging but, in fact, submitted comments, it cannot possibly meet this standard. Mack disagrees, explaining that it heard of the proposal only through a "casual conversation" with a competitor rather than directly from the agency. Mack Truck's Reply Br. at 5. Though Mack is correct that in all the actual notice cases EPA cites, the notice came from the agency, we think this not essential. In National Mining Ass'n v. Mine Safety & Health Administration, the agency contended that comments of another commenter gave petitioner notice. 116 F.3d 520, 532 (D.C. Cir. 1997). Rather than rejecting the agency's actual notice defense out of hand because the notice had not been given directly by the agency, we asked whether the petitioner was "aware[ ]" that the agency was actually "considering adopting what the commenter has suggested" "despite [the agency's] failure to alert the public." Id.

Here, despite Mack's contention that it was merely "speculat[ing] on rumor" when it submitted comments, Mack Truck's Opening Br. at 7, the record indicates that the company was "aware" that EPA was considering abolishing the prohibition on cross-subclass averaging. To begin with, in support of the proposition that Mack heard of the change only through a "casual conversation" with a competitor, the company cites its own petition for reconsideration, which in turn cites an attached declaration that nowhere addresses the issue of how Mack learned of the proposal. See Klein Decl.; see also Fed. R. App. P. 28(a)(6) (requiring that briefs contain citations to the "parts of the record" relied upon). Moreover, the extensive comments that Mack submitted on December 15th give no indication that the company had any doubt about

what EPA was proposing. In fact, in its comments, Mack expressly states that "[i]n discussions with the Engine Manufacturers Association, [EPA] has indicated its intention to include in [the 2007 Rule] provisions that would allow for averaging, trading and banking of emissions across subclasses of heavy-duty diesel engines." Cmts. of Mack Truck at 1.

Mack next argues that even if adequate, the notice was not "fair" because it gave the company less than three weeks to respond to the proposal, resulting in "hurried[ ]" and ill-prepared comments. Mack Truck's Reply Br. at 5. But even with more time, Mack made basically the same arguments in its petition for reconsideration that it made in its initial comments; therefore, we think it quite unlikely that the rule would have been "significantly changed" had Mack received earlier notice. In any event, we have upheld regulations where the notice provided even less time for comments. See Appalachian Power Co. v. EPA., 135 F.3d at 814 (finding a two-and-a-half week notice period sufficient); NRDC v. Thomas, 838 F.2d 1224, 1243 (D.C. Cir. 1988) (finding actual notice two weeks before promulgation of a rule sufficient).

Equally without merit is Mack's next procedural claim: that EPA failed to include in the administrative record discussions held with Mack's competitors, as required by the Clean Air Act's docketing provision, 42 U.S.C. s 7607(d)(6)(C). Mack has neither alleged that EPA relied on any critical "information or data," id., obtained from the disputed conversations nor provided any other reasons to think that there is a "substantial likelihood" that EPA would have "significantly changed" the rule had it received the full content of the conversations. In any event, Mack not only received actual notice of the proposed changes, but it submitted comments, which EPA considered.

Challenging the substance of the ABT program, Mack contends that the agency failed to provide a reasoned explanation for its "sudden reversal of its previous, long-standing

position against cross-class averaging." Mack Truck's Opening Br. at 10. As EPA points out, however, a provision that temporarily allows cross-subclass averaging from 2007 through 2009, but retains the prohibition against banking and trading, can hardly be considered a wholesale reversal of a general policy against cross-subclass averaging, banking, and trading. Respondent's Br. at 60. In any event, EPA fully explained its decision, noting that the revised ABT program adds flexibility during the transition to the new emissions standards. Any adverse environmental effects, EPA observed, would be eliminated by the temporary nature of the cross-subclass averaging and by the 20% discount applied to credit use. Responding to the claim of anti-competitive effects, EPA explained that although it "tries to avoid introducing competitive ... disadvantages when it establishes new emissions control programs, it is not a result [EPA] can ensure; nor is that the primary goal for EPA under the statute." EPA Resp. to Mack Truck's Req. for Recons. at 12.

V. Petition of Alliance of Automobile Manufacturers/Association of International Automobile Manufacturers

Petitioners Alliance of Automobile Manufacturers and Association of International Automobile Manufacturers (collectively, "Alliance") challenge as arbitrary and capricious the 2007 Rule's failure to require ultra-low sulfur diesel fuel "in time to enable ... [light-duty diesel vehicles] to comply" with emissions standards promulgated by EPA in a previous rulemaking, the so-called "Tier 2 Rule." Alliance's Opening Br. at 2. In addition to defending the merits of the 2007 Rule, EPA argues that Alliance's petition is actually a challenge to the Tier 2 Rule and as such time-barred by 42 U.S.C. s 7607(b)(1), which requires all petitions for review to be brought within sixty days of promulgation. We agree with the latter argument.

Promulgated on February 10, 2000, the Tier 2 Rule established new emission standards for light-duty vehicles (basically passenger cars and pickup trucks). Control of Air Pollution from New Motor Vehicles: Tier 2 Motor Vehicle

Emissions Standards and Gasoline Sulfur Control Requirements, 65 Fed. Reg. 6698 (Feb. 10, 2000) (to be codified at 40 C.F.R. pts. 80, 85 and 86). The Tier 2 Rule makes no distinction between traditional gasoline engines and light-duty diesel vehicles, Id. at 6698, which presently comprise only one percent of the total light-duty fleet. Like the 2007 Rule, the Tier 2 Rule attempts to create regulatory flexibility by gradually phasing in the applicable emissions standards, beginning in the 2004 model year. See Tier 2 Rule, 65 Fed. Reg. at 6701-02.

The Tier 2 Rule set emission standards without establishing diesel sulfur limits, and the 2007 Rule altered none of these standards. The Alliance, moreover, concedes that it raised the low sulfur fuel issue in comments to the Tier 2 proposal. Alliance's Reply Br. at 2. EPA considered those comments and concluded that "the interim standards [were] feasible for diesel [vehicles] without further reductions in diesel fuel sulfur." Tier 2 Rule, 65 Fed. Reg. at 6729. With regard to the ability of light-duty diesel vehicles to meet the final standards (triggered in 2007), EPA felt that ultra-low sulfur diesel fuel would likely be required but concluded that "[g]iven the significant potential costs of such fuel changes and the small percentage of [light-duty vehicles] using diesel fuel[,] ... it [was] inappropriate to make such changes in the context of a rule regulating light-duty vehicles and engines." EPA Resp. to Tier 2 Cmts. at 2-12. If the Alliance believed the emissions standards contained in the Tier 2 Rule were infeasible without ultra-low sulfur diesel fuel, it should have petitioned for review of that rule.

Calling the 2007 Rule a "supporting regulation," Alliance argues that a challenge to the Tier 2 Rule would have been a "waste of judicial resources," pointing out that we have in the past "upheld an otherwise valid ... regulation whose validity hinged upon an adequate supporting regulation that the Court nevertheless found wanting." Alliance Reply Br. at 2. The case Alliance cites for this proposition, Automotive Parts Rebuilders Ass'n v. EPA, 720 F.2d 142 (D.C. Cir. 1983), however, is easily distinguishable. There, we upheld EPA's promulgation of "emissions performance warranty regula-

tions," id. at 148, even though in an entirely different case, we had remanded to EPA the reimbursement scheme by which vehicle manufacturers sought reimbursement from part manufacturers, id. at 161 n. 80 (citing Specialty Equip. Mkt. Ass'n v. Ruckelshaus, 720 F.2d 124 (D.C. Cir. 1983)). In upholding the warranty regulations, we specifically conditioned our approval on EPA developing an adequate reimbursement scheme. Id. In that case, it would indeed have been a waste of judicial resources to void the warranty regulations solely because of defects in a reimbursement scheme that we had already remanded. In contrast, the Alliance has conserved no judicial resources by waiting to challenge a failure to require ultra-low sulfur diesel fuel now rather than at the time of the Tier 2 Rule's promulgation.

Nor can Alliance rely on the "reopening" doctrine under which a review period "starts fresh ... if an agency reopens [an] issue by holding out [an] unchanged section as a proposed regulation, offering an explanation for its language, soliciting comments on its substance, and responding to the comments in promulgating the regulation in its final form." Am. Iron and Steel Inst. v. EPA, 886 F.2d 390, 397 (D.C. Cir. 1989). As EPA points out, although some automakers did submit comments advocating that ultra-low sulfur diesel fuel be made available earlier, EPA responded: "Our feasibility analyses as presented in the Tier 2 Rule ... remain our policy regarding light-duty diesel vehicles. We have not reexamined or reopened the issues regarding the Tier 2 standards." EPA Resp. to Cmts. at 9-2.

## VI. Conclusion

The petitions for review are denied.

So ordered.